D 91683 (Pages : 3) Name.....

Reg. No.....

THIRD SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION NOVEMBER 2020

Chemistry

CHE 3B 03—PHYSICAL CHEMISTRY—I

Time : Three Hours Maximum : 80 Marks

Section A

Answer **all** *questions.*

Each question carries 1 *mark.*

1. Write the kinetic gas equation
2. An ideal gas cannot be liquefied. Why ?
3. Write the expression for work done in isothermal reversible expansion of a gas.
4. What are standard state conditions ?
5. State third law of thermodynamics.
6. What is residual entropy ?
7. Why is a drop of liquid spherical ?
8. What is fluidity of a liquid
9. State the relation between Kp and Kc.
10. What is the unit of equilibrium constant of $H_2 + I_2 \rightleftharpoons 2HI$?

(10 × 1 = 10 marks)

Section B

Answer any **ten** *questions.*

Each question carries 2 *marks.*

11. What are the causes of deviation of real gases from ideal behaviour ?
12. The critical temperature and critical pressure of Cl_2 gas are 146°C and 93.5 atmosphere respectively. Calculate the values of van der Waal's constants.

13. Write virial equation of state for real gases.

14. Calculate the temperature at which hydrogen molecules possess an average speed of 1.69×10^3 ms^{-1}.

15. Define 'system' and 'surroundings' in thermodynamics.

16. State second law of thermodynamics and explain the need of the law.

17. Discuss the use of Gibbs Helmholtz equation is assessing the spontaneity of a chemical reaction.

18. How do lattice enthalpy and enthalpy of hydration determine the dissolution of an ionic compound ?

19. What is molar refractivity ?

20. How is viscosity of a liquid related to chemical constitution ?

21. Explain Poiseuille's equation for determination of viscosity.

22. Give the relation between surface tension and density of a liquid.

(10 × 2 = 20 marks)

Section C

Answer any **five** *questions.*
Each question carries 6 *marks.*

23. Briefly describe Maxwell distribution of molecular velocities.

24. Derive the expression for work done in adiabatic reversible expansion of an ideal gas.

25. What is Joule Thompson effect ? Derive the expression for Joule Thompson coefficient.

26. Describe Carnot cycle.

27. Define chemical potential and formulate Gibbs-Duhem equation.

28. Derive the equation for variation of heat of a reaction with temperature.

29. Explain Ostwald's method for determination of viscosity of a liquid.

30. Describe law of mass action and law of chemical equilibrium.

(5 × 6 = 30 marks)

Section D

Answer any **two** *questions.*

Each question carries 10 *marks*

31. Deduce the expression for van der Waal's constants in terms of critical constants. Explain the law of corresponding states and derive the reduced equation of state.

32. Explain the concept of entropy arid compare the entropy changes in reversible and irreversible processes.

33. Discuss Nernst heat theorem and Hess's law of constant heat summation.

34. (a) Illustrate Van't Hoff equation for temperature dependance of equilibrium constant.

    (b) Explain Le Chatlier's principle taking the equilibria of SO_3 and NH_3 generation.

(2 × 10 = 20 marks)

D 91729 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2020

Chemistry

CHE 3C 03—ORGANIC CHEMISTRY

Time : Three Hours Maximum : 64 Marks

Section A (One Word)

Answer **all** *the questions.*
Each question carries 1 *mark.*

1. The isomerism exhibited by alkanes is ————————.
2. The hybridization of carbon atoms in ethyne is ————————.
3. CH_3 group exhibits ———————— inductive effect.
4. The number of possible conformations of ethane is ————————.
5. The reagents used for nitration of benzene are ————————.
6. The product of Wurtz reaction of bromoethane is ————————.
7. The reagent used for idoform test is ————————.
8. Lucas reagent is ————————.
9. Urotropine is prepared from ————————.
10. IUPAC name of picric acid is ————————.

(10 × 1 = 10 marks)

Section B (Short Answer)

Answer any **seven** *questions.*
Each question carries 2 *marks.*

11. What is Hyperconjugation ?
12. Draw Newman projection formula of eclipsed and staggered conformations of ethane.
13. What is racemic mixture ?
14. Write Huckels rule.

15. Write two examples of non benzenoid aromatic compounds.

16. What is Denatured spirit ?

17. How will you prepare anisole by Williamsons synthesis.

18. Suggest a method to convert propanoic acid to 2-Bromopropanoic acid.

19. Aniline is less basic than ammonia Why ?

20. Write two examples of essential amino acids.

(7 × 2 = 14 marks)

Section C (Paragraph)

Answer any **four** *questions.*
Each question carries 5 *marks.*

21. Explain Saponification ? How is it important industrially.

22. Write four differences between DNA and RNA.

23. What is Mutarotation ?

24. Write any *five* reactions of Benzene diazonium chloride with equations.

25. How will you convert ethanol to propanoin acid ?

26. Explain nucleophilic addition reactions with any *four* examples.

(4 × 5 = 20 marks)

Section D (Essay)

Answer any **two** *questions.*
Each question carries 10 *marks.*

27. Explain the formation, stability and reactions of carbocations, carbanions and free radicals

28. Write an essay on a) optical isomerism of lactic acid and tartaric acid.

29. Explain the reaction and mechanism of any four electrophilic aromatic substitution.

30. Explain the effect of substrate structure and stereochemistry of S_N1 and S_N2 reactions.

(2 × 10 = 20 marks)

D 92924 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER (CBCSS—UG) DEGREE EXAMINATION NOVEMBER 2020

Chemistry/Industrial Chemistry/Polymer Chemistry

CHE 3C 03—ORGANIC CHEMISTRY

Time : Two Hours Maximum : 60 Marks

Section A (Short Answer)

Answer at least **eight** *questions.*

Each question carries 3 *marks.*

All questions can be attended.

Overall Ceiling 24.

1. What are carbanions ? What is its hybridization ?
2. Name two groups which show + I effect.
3. What are diastereoisomers ?
4. Why anthracene is aromatic ?
5. What is denatured spirit?
6. What is the chemistry of methanol poisoning ?
7. How will you convert acetic acid to methanol ?
8. How will you prepare ethyl amine from nitroethane ?
9. Draw the cyclic structure of glucose and fructose.
10. What are polypeptides? How are they prepared ?
11. State Isoprene rule.
12. Give the structure of coniine and nicotine.

(8 × 3 = 24 marks)

Section B (Short Essay)

Answer at least **five** *questions.*

Each question carries 5 *marks.*

All questions can be attended.

Overall Ceiling 25.

13. What is hyper conjugation ? Explain with examples.
14. What is Steric effect ? How it influences the rate of chemical reactions ?
15. What is geometrical isomerism ? Explain the geometrical isomerism in maleic acid and fumaric acid.
16. Write the mechanism for the nitration of benzene.
17. What is the effect of substituents on aromatic electrophilic substitution ?
18. Discuss the difference between DNA and RNA.
19. What is isoelectric point of an amino acid ? What are its features ?

(5 × 5 = 25 marks)

Section C (Essay)

Answer any **one** *question.*

The question carries 11 *marks.*

20. (a) How will you prepare alcohols from Grignard reagents ?

    (b) What is iodoform test ?

21. Write notes on :

    (a) Dow's process.

    (b) Kolbe's electrolysis.

    (c) Sandmeyer reaction.

    (d) Hofmann's Carbylamine reaction.

(1 × 11 = 11 marks)

D 92923 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER (CBCSS–UG) DEGREE EXAMINATION, NOVEMBER 2020

Chemistry/Industrial Chemistry/Polymer Chemistry

CHE 3B 03—PHYSICAL CHEMISTRY – I

Time : Two Hours Maximum : 60 Marks

Section A (Short Answers)

Answer at least **eight** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall Ceiling 24.

1. The density of O_2 at 298K and 1 atm is 1.429 gdm^{-3} Calculate the RMS velocity of O_2 at 275K.
2. For O_2 at 25°C calculate mean free path at l atm given d = 361 pm.
3. Define Cp and Cv of an ideal gas. How are they related ?
4. Calculate change in internal energy for conversionof 1 mol of H_2O at 100°C to steam at 1 atm. The heat absorbed and work done by system are 40.7 kJ and 3.1 kJ respectively.
5. How is entropy related to thermodynamic probability ?
6. What is meant by partition function ?
7. State Le chatliers principle.
8. Give relation between Kp and Kc and explain the terms.
9. Name point group to which NH_3 belongs. Write down its symmetry elements.
10. What is an identity operation ?
11. What is meant by axis of symmetry ? Illustrate with an example.
12. What are the symmetry elements ?

(8 × 3 = 24marks)

Section B (Paragraph)

Answer at least **five** *questions.*
Each question carries 5 *marks.*
All questions can be attended.
Overall Ceiling 25.

13. Why Vander waals equation is applicable to real gases? Define compressibility factor and Boyle Temperature.
14. Give a brief account of Maxwell's distribution law of velocities.

Turn over

15. Derive Kirchoffs equation showing variation of heat of reaction with temperature.

16. 10 moles of an ideal gas is expanded reversibly and isothermally from pressure 10 atm to 2 atm at 300K. Calculate maximum work done.

17. Discuss apllications of third law of thermodynamics.

18. Derive Gibbs-Duem equation.

19. Identify symmetry elements in (a) BF_3 (b) C_6H_6 ; (c) benzene ; (d) acetylene. Name point group of these molecules.

(5 × 5 = 25 marks)

Section C (Essay)

Answer any **one** *question.*
The question carries 11 *marks.*

20. (a) What is Joule-Thomson effect ?

(b) Describe Lindes and Claudes method for liquefaction of gases.

21. (a) State and explain the terms law of mass action and chemical equilibrium.

(b) Apply Lechatelier principle to predict effect of (a) change of temperature (b) change of pressure on $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ $\Delta H = 92.05$ KJ.

(1 × 11 = 11 marks)

D 73762 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER (CUCBCSS—UG) [SPECIAL] DEGREE EXAMINATION NOVEMBER 2019

Chemistry

CHE 3C 03—ORGANIC CHEMISTRY

Time : Three Hours Maximum : 64 Marks

Section A (One Word)

Answer **all** *questions.*
Each question carries 1 *mark.*

1. Ethanol and Diethyl ether are ———— isomers.
2. 1-butene and 2-butene are ———— isomers.
3. Number of assymetric carbon atoms in glucose is ————.
4. IUPAC name of maleic acid
5. Catalyst used in Friedel Crafts alkyiation reaction is ————.
6. 10
7. Intermediate of S_N1 reactions is a ————.
8. IUPAC name of ter-butanol
9. Which one of the following has higher pKb value- aniline or p-nitroaniline.
10. Methyl orange is an ———— dye.

(10 × 1 = 10 marks)

Section B (Short Answer)

Answer any **seven** *questions.*
Each question carries 2 *marks.*

11. What is vulcanization ?
12. Write isoprene rule.
13. Draw the structure of ribose.
14. Define saponification number.

Turn over

15. What is Denaturation ?

16. Draw the cyclic structure of glucose.

17. Write any *two* differences between starch and cellulose.

18. What is Sand-Meyers reaction ?

19. What is HVZ reaction ?

20. How will you convert ethyl chloride to butane ?

(7 × 2 = 14 marks

Section C (Paragraph)

Answer any **four** *questions.*
Each question carries 5 *marks.*

21. What are Conformations ? Explain with conformations of ethane and cyclohexane.

22. Write any *two* methods to distinguish geometrical isomers.

23. Explain the mechanism of Friedel Crafts acylation.

24. Explain the MO theory of benzene.

25. Write the preparation and uses of phenolphthalein.

26. Explain the preparation of TNT and picric acid.

(4 × 5 = 20 marks)

Section D (Essay)

Answer any **two** *questions.*
Each question carries 10 *marks.*

27. Explain the preparation and synthetic applications of benzene diazonium chloride.

28. Write an essay on preparation and applications of Grignard reagent.

29. Explain the primary, secondary and tertiary structure of protein.

30. Write a note on source, structure and uses of citral and menthol.

(2 × 10 = 20 marks)

D 11821 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER (CUCBCSS-UG) DEGREE EXAMINATION NOVEMBER 2021

Chemistry

CHE 3C 03—ORGANIC CHEMISTRY

(2014—2018 Admissions)

Time : Three Hours Maximum : 64 Marks

Section A

Answer **all** *the questions.*

Each question carries 1 *mark (one word).*

1. Homolytic bond fission in a reaction leads to the formation of ————.
2. The hybridization of carbon atoms in benzene is ————.
3. Halogens exhibits ———— inductive effect.
4. Which carbocation is more stable ? primary/ secondary/ tertiary
5. The preferred conformation of methyl cyclohexane is ————.
6. The reagent and substrate used in Wurtz reaction are ————.
7. Number of pi electrons of naphthalene is ————.
8. Alkyl magnesium halides are known as ————.
9. TNT is used as ————.
10. The nitrogenous base that is not present in DNA is ————.

(10 × 1 = 10 marks)

Section B

Answer any **seven** *questions.*

Each question carries 2 *marks. (short answer).*

11. State isoprene rule.
12. Draw the structure of nicotine.
13. What is vulcanization ?
14. Why oils are hydrogenated ?

Turn over

15. Write *two* differences of amylose and amylopectin.

16. Draw the structure of methyl orange.

17. What is Williamsons synthesis ?

18. How Toluene is converted to TNT ?

19. Kb value increases in the order Methylamiine, Dimethylamine, Triethylamine Why ?

20. Write *two* examples of neutral amino acids.

(7 × 2 = 14 marks)

Section C

Answer any **four** *questions.*
Each question carries 5 *marks (paragraph)*

21. How soap is prepared ?

22. Write the preparation and uses of phenopthalein.

23. Write *three* evidences for cyclic structure of glucose.

24. Write any *three* synthetic applications of Grignard reagents.

25. How will you convert ethanol to propanoic acid ?

26. Distinguish between S_N1 and S_N2 reactions.

(4 × 5 = 20 marks)

Section D

Answer any **two** *questions.*
Each question carries 10 *marks. (Essay).*

27. Explain the primary, secondary and tertiary structure of proteins.

28. Write an essay on conformations of ethane and cyclohexane.

29. Explain the structure of benzene and aromaticity.

30. Explain the preparation of ethanol from molasses.

(2 × 10 = 20 marks)

D 11820 **(Pages : 3)** **Name**.....

Reg. No.....

THIRD SEMESTER (CUCBCSS–UG) DEGREE EXAMINATION NOVEMBER 2021

Chemistry

CHE 3B 03—PHYSICAL CHEMISTRY—I

(2014—2018 Admissions)

Time : Three Hours Maximum : 80 Marks

Section A

Answer **all** *questions.*
Each question carries 1 *mark.*

1. What is compressibility factor of a gas ?
2. Define mean free path.
3. Give example of an isolated system.
4. What is Zeroth law of thermodynamics ?
5. Enthalpy of neutralization of weak acid and weak base will be always less than – 57.1 kJ. Why ?
6. What is the standard molal enthalpy value of O_2 ?
7. State Poiseulle's equation for the determination of viscosity of a liquid.
8. Total molar refractivity of a solution where n_1 and n_2 are the mole fraction and r_1 and r_2 are molar refractivity values of the solvent and solute respectively can be written as....
9. State Law of mass action.
10. What is the effect of pressure on the decomposition equilibrium reaction of HI to H_2 and I_2 ?

(10 × 1 = 10 marks)

Section B

Answer any **ten** *questions.*
Each question carries 2 *marks.*

11. Calculate the RMS velocity of SO_2 molecule at 427°C.
12. Why do real gases deviate from ideal behaviour ?
13. State the virial equation of state.

Turn over

14. What is Joule Thompson effect ?

15. Show that heat capacity at constant volume of a system is the rate of change of internal energy with temperature at constant volume.

16. He and H show heating effect on adiabatic expansion. Why ?

17. Calculate the work done during isothermal expansion of one mole of an ideal gas from 10 atmosphere to 1 atmosphere at 300K.

18. Calculate the amount of heat liberated in the neutralization of 0.75 mole of nitric acid with 0.75 mole of NaOH.

19. Show that Parachor of a liquid is the volume of that liquid at a temperature at which its surface tension is unity.

20. What is the effect of temperature on surface tension ?

21. The parachor values of ethane and propane are 110.5 and 150.8 respectively. What values of parachor do you expect for hexane ?

22. The manufacture of ammonia is usually done at elevated pressure conditions. Why ?

(10 × 2 = 20 marks)

Section C

Answer any **five** *questions.*
Each question carries 6 *marks.*

23. Explain the PV isotherms of CO_2 with a discussion on the continuity of state.

24. Show that decrease of both Work function and Gibbs free energy of a system with respect to temperature give rise the entropy of the system.

25. (a) State Carnot theorem ; and (b) Calculate the maximum efficiency of a steam engine operating between 110°C and 25°C.

26. Discuss the mathematical formulation of Gibbs Helmholtz equation.

27. Formulate the integrated from of Clausius Clapeyron equation. Discuss its applications.

28. Discuss the Nemst heat theorem and state third law of thermodynamics.

29. Illustrate the use of Ostwald's viscometer for determination of viscosity of a liquid.

30. Explain the effect of temperature and pressure on the reactions of formation of SO_3 and decomposition of PCl_5.

(5 × 6 = 30 marks)

Section D

Answer any **two** *questions.*
Each question carries 10 *marks.*

31. What are critical constants ? Derive expressions for critical constants in terms of van der Waal's constants.

32. Explain Hess's law and formulate Kirchoff's equation.

33. Discuss the concept of chemical potential and draft Gibbs Duhem equation.

34. Provide the thermodynamic derivation of Law of chemical equilibrium and comment on the spontaneity of a reaction in terms of free energy change and equilibrium constant.

(2 × 10 = 20 marks)